Interpreting ACS Coverage Rates: The Importance of Seasonal Population Movements in the American Community Survey

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In addition to providing valuable hints about coverage patterns in the American Community Survey, ACS coverage rates[1] provide unique information about two other important phenomena: patterns of error in the Census Bureau's population estimates, and patterns of seasonal migration.

The Nature of ACS Coverage Rates. A pure coverage rate would compare the number of people covered by a survey to the actual population that should have been covered. Unfortunately, the "actual population" is usually unknown. In practice, therefore, coverage rates are calculated using some approximation of the population. Coverage rates produced in this manner are not simply indicators of the pattern of survey coverage: they also reflect any ways in which the selected approximation deviates from the actual population.

When such deviations are very small or when survey coverage is very poor, it is reasonable to interpret coverage rates primarily as indicators of coverage patterns. When deviations from the true population are substantial and survey coverage is good, on the other hand, the coverage rates can tell us more about the selected approximation of the true population than about how much of the population was covered by the survey.

Coverage rates for the ACS are calculated by dividing "uncontrolled ACS estimates of household population"[2] by the Census Bureau's "official estimates of household population." The official estimates differ from the actual population in several important respects:

- Because the population estimates are based on the 2000 Census, they reflect the pattern of coverage error in the census.
- The estimates do not capture post-census population changes with complete precision.
- Because the estimates are based on the census, they reflect the way the census handled seasonal residents. This was quite different from the way seasonal residents are handled by the ACS.

Although coverage error in the census[3] and errors in population estimates[4] are topics worthy of comment, this paper focuses primarily on what ACS coverage rates can tell us about seasonal population movements.

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[1] Available from the U.S. Census Bureau website: http://www.census.gov/acs/www/UseData/sse/index.htm

[2] Published ACS figures have been "controlled" to the official estimates of household population by age, race, sex, and Hispanic origin, i.e. preliminary results have been inflated or deflated to produce final figures that are consistent with the estimates. The preliminary results used in that calculation are referred to as the "uncontrolled estimates of household population." They reflect weighting of survey results to account for non-response and to achieve consistency with the Census Bureau's estimates of housing units, but they have not been controlled to official estimates of household population levels. (People in prisons, dormitories, and other non-household living situations were not included in the ACS until 2006, and they have not been included in the numerator or denominator of ACS coverage rates.)

[3] Because the population estimates upon which they are based reflect any errors in the census, the ACS coverage rates only reflect coverage patterns *relative to the 2000 Census.* Thus, even if the population estimates captured population changes perfectly, a coverage level of 100% would not indicate perfect coverage by the survey—it would just indicate that the ACS had the same level of coverage error as the census upon which the estimates were based.

Seasonal Population Movements in the ACS. Because the ACS is conducted throughout the year, it is able to shed light on seasonal population movements that have not been captured by the decennial census.

The ACS counts people at whatever location they are found, provided that they are staying there for a period of two months or more. Thus, monthly measurements of vacancy rates and average household size can be expected to fluctuate over the course of each year as "snowbirds" and other seasonal migrants move from one location to another. A typical northern state is likely to have its highest vacancy rates and lowest average household size in the coldest months, while a typical southern state is likely to have its highest vacancy rates and lowest household size in the warmest months.

Although published annual statistics on vacancy rates and household size do not shed much useful light on seasonal population movements,[5] the effect of such movements over the course of a year is captured by the coverage rates. The uncontrolled ACS estimate of household population, which serves as the numerator of the coverage rate, reflects each state's average population during the year. A state's "average population" is not necessarily identical to its number of "usual residents," but the two figures should be fairly close in most situations.[6]

Seasonal Population Movements in the Census. Census residence rules call for everyone to be counted at their "usual residence." In the case of seasonal migrants, such as "snowbirds" who

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This has important implications for interpreting ACS coverage rates for segments of the population. A comparison of ACS coverage rates by sex suggests that several states have higher coverage for males than for females. If these were "pure "coverage rates, this would mean that the ACS achieved better coverage for males than for females in these states. But these are, at best, only *relative* coverage rates. Leaving aside the possibility of estimation error, these coverage rates suggest only that the ACS achieved higher coverage of males than the 2000 Census in these states. It is possible that survey still covered males more poorly than females.

In a majority of states, the ACS coverage rates are slightly lower for males than for females. It is important to recognize that these coverage differences are above and beyond any undercoverage of males in the 2000 Census.

[4] The population estimates should be very accurate near the time of the census, but they can become progressively less accurate in subsequent years. Thus, estimation error is a plausible explanation for any coverage rates that become progressively higher or progressively lower over time. Estimation error is less likely to provide a plausible explanation for coverage patterns that became evident with the 2000 survey and have not changed appreciably since then. Nevada is the only state that has had a substantial and progressive change in coverage rates in every year since the 2000 Census. Several states had substantial changes between 2000 and 2001, and several had peaks or troughs in 2002. For most states, coverage rates have fluctuated up and down from year to year or remained fairly stable.

[5] Published ACS results have been controlled to be consistent with population estimates. Thus, the published number of persons per household is the *weighted* number of persons per household. It is not the average household size found by the survey, but, rather, the average household size that reconciles the estimated number of occupied housing units with the estimated level of population.

[6] In the most unfavorable case, all seasonal migrants spend six months plus one day in State 1 and six months minus one day in State 2. Their usual residence would be in State 1, but they would make almost equal contributions to the average population of both states. In the most favorable case, some seasonal migrants would spend most of the year in a northern state while an equivalent number spend most of the year in a southern state. In this case, each state's average population should be exactly equal to its number of usual residents. College students tend to fall somewhere in between these two extremes, since they often spend about nine months at school and three months elsewhere. They therefore tend to make a smaller contribution to the average population of a college town than to its number of usual residents.

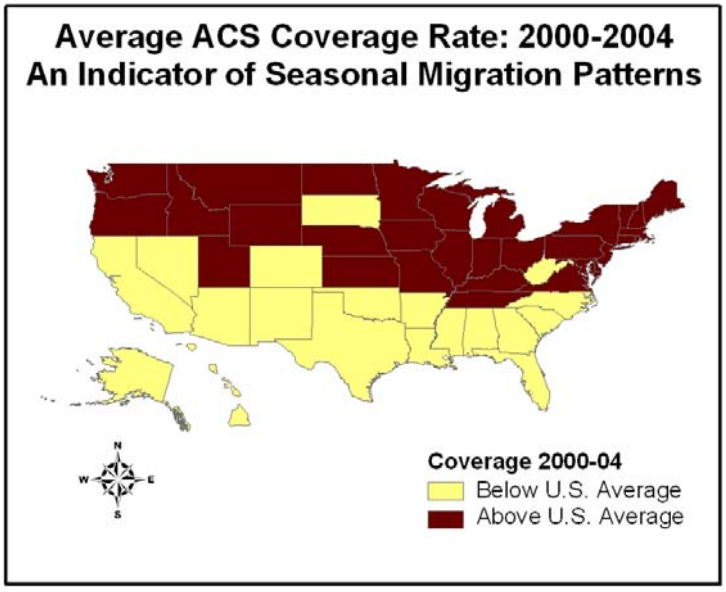
spend part of the year in the North and part of the year in the Sunbelt, this would be the residence at which they spend the largest part of the year.

Unfortunately, the instructions for the 2000 Census did not direct respondents to indicate their usual residence or to fill out a census form only for their usual residence. *It is, therefore, reasonable to hypothesize that many seasonal residents were counted at the locations where they received census forms in March or April, even if they spent a larger part of the year at a different residence.*

A Strategy for Testing the Hypothesis. If that hypothesis is true, then the average population suggested by the ACS should tend to be fairly high relative to census-based population estimates for the northern states from which many usual residents were absent while the census was conducted. Similarly, the average population suggested by the ACS should tend to be fairly low relative to census-based estimates for the Sunbelt states in which those residents would have been counted.

The ACS coverage rate is precisely the statistic that is required to test this hypothesis, since it is the result of dividing the average population suggested by the ACS by the official census-based population estimates. Thus, the hypothesis suggests that northern states should be expected to have high coverage rates while southern states have low coverage rates.

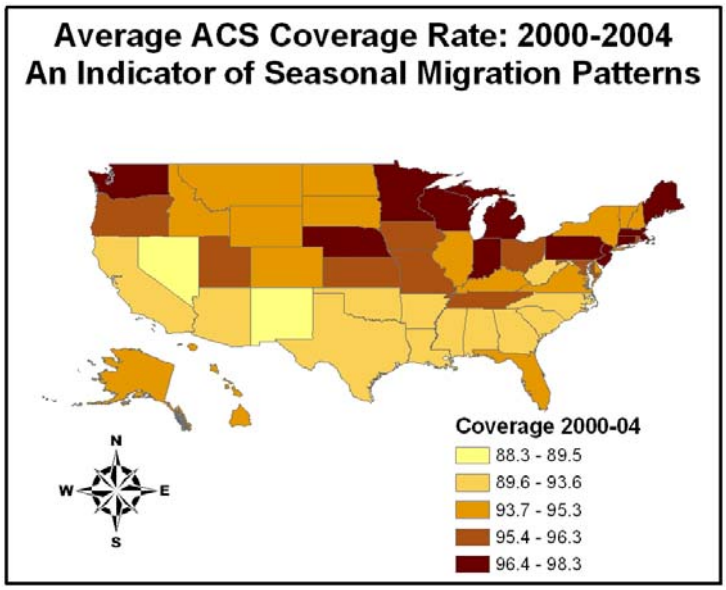
The Regional Pattern of ACS Coverage Rates. The actual pattern of ACS coverage rates from 2000 through 2004 is highly consistent with that hypothesis, as shown in the maps below.



- Almost all southern states have coverage rates below the national average, including all states in the Deep South.
- Almost all northern states have coverage rates above the national average.
- The most notable exceptions are Alaska and South Dakota, which have coverage rates very close to the national average.

- Because a strong north/south pattern appeared immediately in coverage rates from the 2000 survey, and because the pattern has persisted from year to year, it is not likely to be caused by estimation errors that develop gradually over the course of a decade.

The second map is based on the same data, but it uses a larger number of shading patterns to show variations among states in each region. The middle category includes five states that are slightly below the national average of 94.6 percent, as well as eleven states that are above the national average.



The north/south pattern found in the maps suggests very strongly that the census-based population estimates, as well as the 2000 Census itself, tend to count a substantial number of seasonal migrants in the Sunbelt rather than at their usual residences. The strength of this interpretation derives from (a) the very close correspondence between the regional pattern of ACS coverage rates and likely patterns of seasonal migration, (b) the absence of obvious alternative explanations based on likely regional patterns of error in survey coverage[7] or in estimates of population change,[8] and (c) the logical plausibility of the hypothesis itself. Indeed, given the lack of any reference to usual residence in the census instructions, it would be more surprising to find seasonal migrants counted at usual residences from which they are absent than to find that they are counted where they receive census forms.

Directions for Future Analysis. Although coverage rates provide valuable insights about seasonal migration, the Census Bureau can use data that has already been collected by the ACS to produce much more definitive information about this topic. In addition, minor changes to future census forms can help ensure that seasonal migrants are counted at their usual addresses.

[7] Since the population estimates already reflect any coverage error in the census, an explanation of the north/south pattern based on coverage error would have to involve a difference between ACS coverage patterns and census coverage patterns.

[8] The birth counts, death counts, and tax-return data used in population estimates have not produced large north/south errors in the past. If there is an overestimate of international immigration, however, it could conceivably contribute to the regional pattern of coverage rates.

Specific steps that can be taken by the Census Bureau include the following:

(1) Tabulate ACS data on vacancy rates and "uncontrolled average household size" by month.

Although individual monthly figures would have very wide confidence intervals, particularly for small areas, the monthly data could be aggregated over a period of years to produce reliable seasonal patterns.

Unlike coverage rates, such data would:

- Provide specific information about the magnitude and timing of seasonal population movements;
- Separate the pattern of seasonal population movements from patterns of survey coverage and estimation error; and
- Provide meaningful information about seasonal migration for a wide range of geographic areas.

Such data would be valuable for many purposes, such as: analyzing regional variations in mortality rates, interpreting migration rates and other data derived from past censuses and from the ACS, and projecting future population levels. In states and communities that are strongly affected by seasonal population movements, the new information would be useful for transportation planning, health facility planning, and numerous other purposes. It could potentially serve as a basis for future estimates of average annual population that could serve as controls for annual ACS data, as well as estimates of population at various points during each year.

(2) Produce seasonal tabulations of demographic, social, economic, and housing characteristics.

Once the importance of seasonal population movements is recognized, it will be possible to produce more comprehensive ACS products with seasonal data. The Census Bureau's recently published tables on the impact of Hurricane Katrina[9] can serve as a model for such products. Just as those tables described the Gulf Coast before and after a hurricane, seasonal ACS tabulations could describe each state and community in the summer and winter.

(3) Improve instructions on future census forms.

Census instructions should be improved to ensure that seasonal migrants and other people with multiple residences are counted at their usual homes. For example, respondents could be asked whether any listed members of their households spend a larger part of the year at different addresses. If "yes," they could be asked to provide those addresses and indicate which household members are associated with each address.

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[9] Currently available at: http://www.census.gov/acs/www/Products/Profiles/gulf_coast/index.htm